FALL 2006

CHEMISTRY DEPARTMENT

GUIDELINES

FOR GRADUATE STUDENTS

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FORMAL REQUIREMENTS AND PROCEDURES FOR ADVANCED DEGREES

A. UNIVERSITY-WIDE REQUIREMENTS

Requirements for advanced degrees, together with regulations of the Graduate School, are described in the publications:

(1) *Graduate Degree Programs Bulletin*

(2) *Thesis Guide*

These are available at the Graduate School office, 114 Kern Graduate Building or on the Graduate School web page (http://www.gradsch.psu.edu/). **All graduate students are expected to assume full responsibility for knowing these requirements and procedures.**

B. DEPARTMENT REQUIREMENTS

Candidates for advanced degrees in Chemistry must meet the following requirements established by the Chemistry Department faculty.

1. Area Qualifying Requirements

Placement exams in analytical, biochemical, inorganic, organic and physical chemistry are given to all new students. The qualifying requirement for certification as a Ph.D. candidate is that a student must demonstrate proficiency in physical chemistry, as well as two additional areas. For certification as a M.S. candidate, proficiency is required in physical chemistry, as well as one additional area. Proficiency may be demonstrated by either:

a. passing the area examination upon entrance,

b. obtaining a grade point equivalent of 3.0 in at least three credits of approved course work in the area. The courses will be designated by the Graduate Counseling Committee (GCC). Course work used to establish proficiency must be completed during the student's first two semesters of residence.

The GCC meets with each new graduate student after the qualifying examinations to help plan a course schedule. Courses are chosen first to make up any deficiencies revealed by the examinations, and second to give the student advanced training in their area(s) of interest. The Chemistry Department provides chemistry course syllabi of all the graduate and upper-level undergraduate courses that will be offered during the academic year.

The GCC examines the transcript of each first-year student at the end of spring semester to review progress and to recommend whether the student should be certified as a candidate for an advanced degree. The Chemistry Department requires a grade point average of 3.0 in <u>all</u> course work for admission to Ph.D. candidacy. Chemistry 602 (Supervised Experience in College Teaching) is <u>not</u> used in computing this average. Students who have not met the area qualifying and GPA requirements will be either admitted to M.S. candidacy or dropped from the graduate program. At the discretion of the GCC, those students admitted to the M.S. candidacy may be permitted to petition for readmission to Ph.D. program.

2. Course Requirements

A Ph.D. candidate is required to take a minimum of five 3-credit graduate-level courses. The only 400 level courses that may be used to satisfy requirements are CHEM 408, 439, 448 and 455. A candidate's doctoral committee may also require additional specific courses. Many other courses may be appropriate, but please consult with your advisor and/or the Graduate Program staff. Requests for using non-chemistry courses at the 400 or 500 level toward the five 3-credit graduate-level courses should be made to the Chair of the Graduate Counseling Committee. A syllabus should be provided with the request.

3. Chemistry 500 – Seminar in Chemistry

All graduate students are required to enroll for 1 credit of CHEM 500, *Seminar in Chemistry*, during each semester of their first and second years in residency. Detailed information concerning CHEM 500 is provided during orientation. Be sure to follow the guidelines applicable to your year of entry into the program.

4. Safety Examination Requirement

Before beginning laboratory research, a student must pass the safety examination administered by the department's Safety Committee. Work in any laboratory is contingent on this prerequisite, which is strictly enforced. Safety examinations will be offered during orientation. Arrangements for those students failing the exam will be made by the Graduate Program Office.

5. Chemical Storage and Waste Management

All graduate students working in a lab are required to receive training on handling of chemicals and chemical wastes. Individuals must be trained within 90 days of arriving at Penn State.

6. Teaching Requirement

All graduate students must serve as a teaching assistant for at least one semester. During at least one semester that a student is a teaching assistant, the student must be registered for 1 credit of Chemistry 602, Supervised Experience in College Teaching.

7. English Requirement for International Students

All entering international students are required to take an American English Oral Communicative Proficiency Test. The test is administered by the university's Linguistics and Applied Language Studies Department.

The oral proficiency test is given **only** at the beginning of fall and spring semesters. Students are required to pre-register for the test. The test scores are available through the Chemistry Department Graduate Office.

a. Those students who achieve a score of 250 or above on the exam may be approved for teaching.

b. Those students whose score below 250 will be required to enroll and pass classes designated by the university's Linguistics and Applied Language Studies Department. Students need to pass all courses with an "A". **Completion of ESL 118G is mandatory before a student will be allowed to teach.**

c. Students, who are required to enroll in ESL courses, must satisfy the requirements within the stated time limits:

i. ESL 115G – end of fourth semester

ii. ESL 116G – end of third semester

iii. ESL 117G – end of second semester

iv. ESL 118G – end of second semester

Students who fail to satisfy the requirements within the stated time frame will be **required** to enroll in ESL classes during the summer semester, with the possibility of being responsible for paying the tuition and fees. Although students may be certified for an advanced degree, provided they have satisfactorily met **all** other requirements, the Oral Comprehensive Examination will not be administered until the oral proficiency requirement has been fulfilled.

8. Doctoral Committee/First-Year Report/Committee Meeting

a. Doctoral Committee. A committee is chosen at the end of the student's second semester based on the Chemistry Department certification that the student is a candidate for the Ph.D. degree. The student and their preceptor will select a Doctoral Committee consisting of, at least, the preceptor, two other members of the Chemistry Department, and one faculty member from another department. All must be members of the Graduate School.

The Committee as a whole is responsible for guiding the academic program and monitoring the progress of a student throughout their graduate career. Discussions of research (or other matters) with them can often provide important perspectives and insights from direct involvement in the research. The closer the connection to these faculty members over the years, the more beneficial it will be to you when they are called upon to write recommendation letters to future employers.

b. First-Year Report and Committee Meeting. Each student is required to meet briefly (~20 minutes) with their newly established Doctoral Committee **as a group** by the end of the twelfth month of residence. At least one week prior to this meeting, a short written report (fewer than 5 double-spaced pages; the committee reserves the right to return reports that do not comply with this limit) outlining plans for the initial stages of the students thesis research must be distributed to the committee. Students are responsible for scheduling the committee meeting. The purpose of this meeting is to obtain feedback on the report, guidance in the direction of future research, and to familiarize each student with their committee. The 1st year committee form and report need to be completed and returned to the Graduate Program Office before the end of the twelfth month of residence. Requests for extension must be approved by the Chair of the GCC. *This meeting is not an examination.*

c. Your doctoral committee is formed after consultation with your research advisor. The composition of this committee is made to enhance your graduate experience. Any change to the committee, substitution of committee members, or participation by committee members at a distance must follow university guidelines. All committee members, former and new, must be notified of the changes.

d. After the committee meeting, you are asked to update your graduate profile on the chemistry web site (see section 11).

9. Seminar Requirements

Two seminars are required of every student.

a. The first seminar is part of your Chemistry 500 requirement. It must be presented prior to taking the oral comprehensive exam and during the first two years in residence. This seminar is to be given in one of the area seminar series on a topic not closely tied to research being done within the department. A written report must be prepared as a part of the overall requirement. See section 16.c for additional information.

b. The second seminar will sum up the research that you performed during your graduate career. The seminar is open to the public and constitutes the first part of the Thesis Defense (see below).

10. Oral Comprehensive Examination Requirement

A Ph.D. candidate may take the comprehensive examination any time after meeting the qualifying, course, and seminar requirements. The comprehensive examination must be taken within a student's first two and one-half years of residency (or within one year after receiving a Penn State M.S. degree in Chemistry). The examination must be scheduled **at least three weeks** in advance through the Chemistry Department Graduate Program Office.

The Doctoral Committee administers the comprehensive examination. During the examination, the committee will review the candidate's progress. The committee may question the candidate on any topic relevant to obtaining a Ph.D. in Chemistry. To provide a framework for the examination, the candidate is required to:

a. Prepare and distribute to the Committee at least **one week** in advance a 3- to 5-page report[1] on thesis research, outlining the progress to date and proposing plans for future work. The candidate may also be asked to provide a 15-minute synopsis of this report in the form of an oral presentation.

b. Prepare and distribute an original research proposal to the committee at least **one week** in advance. The proposal may be on any chemical (or chemically related) topic except that it may **not** be directly related to the candidate's thesis research or to work being done by others at Penn State. The candidate must consult with each of the committee members to verify the suitability of the chosen topic. The proposal should also be 3 to 5 pages in length.[1] The candidate should be prepared to present a 15-minute oral presentation of the proposal.

c. Include the graded CHEM 500 proposal in the package distributed to the committee at least **one week** in advance of the scheduled oral examination. See section 16.b.

The format of the comprehensive examination will typically be as follows. Immediately prior to the examination the committee will meet in the absence of the student in order to discuss issues related to the student's exam. The first half-hour of the exam may consist of open questions used to judge the candidate's general background knowledge in areas the

[1] This page limit includes single-spaced text (12 point or greater font) with 1" margins. Figures and references (size 10 font permissible) should not exceed four additional pages. The committee reserves the right to return proposals that do not comply with the recommended format.

committee feels appropriately related to the student's course of research and study. The committee will then usually choose to have the student present one of the two proposal talks (but may also choose to hear both or neither). Further questioning will generally be related to the specifics of the proposals. Following the questioning, the candidate will be asked to leave the room briefly while the committee discusses his or her performance. The candidate will then be called back to the committee to be informed of its decision (pass or fail) and to discuss the committee's perceptions of the candidate's areas of strength and weakness and its recommendations for future scientific growth.

In the event that a student fails, the committee will recommend further action. If the exam is to be re-taken, the committee will set a date for completion of the requirement, not to exceed 6 months after the original exam date.

11. Post-Comprehensive Progress Reports

Subsequent to the comprehensive examination, a student is required to provide his/her Doctoral Committee with a *yearly progress report*. This report should be prepared at the end of Spring Semester, regardless of the anniversary date of the comprehensive exam. The report is to be submitted on-line (http://www2.chem.psu.edu/gradreview/app1.php). Instructions are provided on the site. Before final submission, the report is to be reviewed and discussed by the student and the research advisor. Following this review, advisor and student will sign an evaluation form. A copy of the report and signed form are to be turned in to the Graduate Program Office by the deadline posted on the site (June 1). Advisor and student can request that the student meet with committee members either on an individual basis or as a group. Appropriate signatory forms for committee members are available on the chemistry department evaluation site listed above.

12. Final Thesis Defense

The final thesis examination needs to be scheduled in the Chemistry Department Graduate Program Office **three weeks in advance**.

a. Each member of the Doctoral Committee is to be given a copy of the thesis **at least two weeks in advance** of the defense.

b. The defense begins with an oral seminar open to the public.

c. Following the public presentation, the Doctoral Committee questions the candidate in a closed-door defense examination.

13. Thesis Requirement

In addition to the Graduate School requirements, described in the *Thesis Information Bulletin* (http://www.gradsch.psu.edu/current/thesis.html), the Ph.D. and Masters candidate is expected to furnish their preceptor with one bound, high-quality copy of the thesis.

14. M.S. Requirements

M.S. candidates, whether or not they intend to proceed to the Ph.D. degree, should obtain a copy of the Chemistry Department's guidelines for "Requirements for the Degree of Master of Science." Beyond the qualifying examinations, the only formal testing to which M.S. candidates are subjected is a final oral examination. This examination, which is held only after the M.S. thesis has been completed, is administered by a committee consisting of the student's research preceptor and two other faculty members. A final copy of the thesis and

signature page must be turned into the graduate office located in 105 Chemistry Building. The signature page is generated by the Graduate Program Office.

15. Penn State Policies Regarding Termination of a Teaching Assistantship

All graduate students on an assistantship at Penn State University sign a contract entitled "Terms of Offer of a Graduate Assistantship and General Conditions of Graduate Assistantship Appointments." This document stipulates that "Satisfactory performance of both assistantship duties and academic duties is a condition of the appointment. A graduate assistantship may be terminated if a graduate student fails to meet departmental standards."

The Graduate School at Penn State University (http://www.gradsch.psu.edu/) sets the policies for termination of assistantships due to inadequate performance. Excerpts from the current policies (http://www.gradsch.psu.edu/policies/student/appendix4.html) are reproduced below.

A Performance Improvement Meeting - When a supervisor determines that a graduate assistant is failing to meet acceptable standards, the supervisor will meet with the assistant. Together, they will review the duties and responsibilities expected of the graduate assistant, and the supervisor will identify those areas in which the performance of those duties and responsibilities is judged to be substandard. The supervisor should then advise the graduate assistant that if his or her performance does not improve to a satisfactory level within a time period specified by the supervisor, the assistantship will be terminated. The time period established by the supervisor should provide a sufficient and reasonable time for the graduate assistant to demonstrate a satisfactory level of performance. In some instances, the graduate assistant's failure to meet acceptable standards of performance may be disruptive of the educational process (e.g., failure to appear for a teaching assignment class, or failure to grade examinations in a timely fashion). In such instances, the graduate student should be advised that any subsequent failure to meet acceptable performance standards may result in subsequent termination of the assistantship. As soon as possible following this meeting (generally within five calendar days) the supervisor will provide the assistant with a written summary of the meeting, a copy of which will also be sent to the administrator of the unit.

Termination of Assistantship - If a graduate assistant fails to meet acceptable standards of performance as prescribed in the performance improvement meeting, the supervisor will notify the administrator of the unit. The unit administrator will schedule a meeting with the supervisor and graduate assistant as soon as possible, generally within three days. At that meeting, the graduate assistant's performance will again be reviewed. If it is concluded that the graduate assistant has failed to meet acceptable performance standards, the administrator of the unit may terminate the graduate assistantship appointment. The administrator of the unit will provide a written summary of the meeting and of the action taken to the graduate assistant, the dean of the college, and the associate dean of the Graduate School. Students should be notified, in writing, of consequences with regard to healthcare and/or other benefits when termination of an assistantship occurs, and be referred to the University's Student Insurance Office to determine the nature and extent of these consequences in individual cases. When termination occurs prior to the end of the semester, consideration should be given to providing a grace period prior to cessation of

payroll, if necessary, in order to provide the student with an opportunity to arrange for alternative healthcare coverage or to make other arrangements.

An alternate procedure may be followed in cases in which substandard performance is "disruptive of the educational process". One example of this would be failure to appear for a teaching assignment class. In such cases, the graduate student will be advised at the Performance Improvement Meeting that any subsequent failure to meet acceptable standards may result in immediate termination. In other words, the second meeting described above ("Termination of Assistantship") is not required in these cases.

If a graduate assistant wishes to appeal a decision of termination of an assistantship for inadequate performance, he/she may file a written appeal within 10 calendar days of receipt of the written notice of termination with the individual to whom the unit administrator reports. In cases where the assistantship is funded through multiple units (e.g., stipend from one budgetary unit and tuition from another), the decision to terminate the assistantship should be done in consultation with both (all) units involved, and any appeal must be considered jointly by the individuals to whom the respective unit administrators report. See http://www.gradsch.psu.edu/policies/student/appendix2.html for further information.

16. CHEM 500 – Seminar in Chemistry

All graduate students are required to enroll for 1 credit of CHEM 500, *Seminar in Chemistry*, during each semester of their first and second years in residency. This requirement contains three components: reports, proposal, and seminar.

A grade of 3.0 (B) or better is required on the cumulative total of 4 credits for CHEM 500.

a. Chemistry 500 Reports: An integral part of graduate education is provided by seminars. During the first year of graduate study every student is asked to write short reports on a small subset of attended seminars. These reports are intended to accomplish three main goals:

1. help develop critical judgment concerning research presented by others
2. practice and thereby improve writing skills
3. institute regular attendance and participation in departmental seminars

Writing workshops will be offered as part of the CHEM 500 report assignment. The first workshop will be held during orientation. The next one will take place during Fall semester and the last two during Spring semester. These workshops are designed to provide additional guidance in scientific writing. The schedule will be posted on ANGEL (see below).

Four reports are required. The first is initiated during orientation and completed in the first few weeks of the semester. Detailed instructions will be provided during orientation. Completion of a second report during the 1st semester is highly recommended. The remainder must be completed by the end of the 2nd semester of residence. Standard course policies apply to the CHEM 500 reports. Failure to complete the requirement will result in having to retake the course (writing 3 reports) during the 3rd semester in residence. Extension beyond the 3rd semester in residence will require petitioning the GCC.

You may report on seminars by outside speakers only (i.e., not a PSU student or a PSU Chemistry Faculty member) in any of the departmental area seminar series, the departmental colloquium series, and seminars in other departments as judged appropriate by your preceptor.

CHEM 500 reports are submitted and processed with ANGEL (https://cms.psu.edu/). Instructions and dedicated cover sheets are posted on ANGEL and on the Chemistry web site.

Reports 2 to 4 will be graded by your preceptor. The guidelines for these reports are as follows:

1) Choose a seminar that you are interested in summarizing; consult with your preceptor for approval as he or she may work with you on the report.
2) Within one week of the seminar, submit to ANGEL (CHEM 500 course, in a drop box with your name, report number and version) an electronic draft of your report with cover sheet. Notify your preceptor that you have submitted a draft and follow his or her preferences for draft inspection. Most preceptors will use ANGEL, some may ask that you e-mail or print a copy to them. After examination of your draft, your preceptor may require that you work with a writing tutor. For information on this service, see the Graduate Program Office staff.
3) As soon as you have submitted your draft, begin working with your preceptor on improving your report. You should feel free to go through as many iterations as acceptable to both of you.
4) Within three weeks of the seminar date, submit your final report to ANGEL (CHEM 500 course, in a drop box with your name, report number and version). Use the electronic cover sheet available on the site. Please be advised that the drop box will not be available after the three-week deadline (5 pm). Notify your preceptor that you have submitted the final draft. Grade and comments will be returned to you directly or via ANGEL. The evaluation will be based mainly on scientific accuracy, organization and writing quality (see sample grading sheet). Your overall grade for 1 credit of CHEM 500 will be assigned at the end of the spring semester. It will be a qualitative grade (A, A-, …, F) based on the average of the report grades received.

Reports should be *no more than two double-spaced pages in length*. An additional page may be used for references, descriptions of molecular structures, or figures if needed.

A summary of suggested report contents follows:

<u>Introduction</u>

- Introduce the speaker by name and title.
- Efficiently set the scientific context for the talk, establishing the problem being studied and summarizing current knowledge about the problem.
- State the speaker's expressed research objective.

<u>Body</u>

- Summarize the methods applied to the research problem.
- Describe the research results and interpretation offered by the speaker.
- Summarize the methods applied to the research problem.

- Provide critical commentary on the research through the use of sources, figures, tables, or equations, scrupulously citing any sources you use with a superscripted number.
- Consider the use of section headings to organize the body of the report, using organizing principles of either the various facets of the research problem or the speaker's methods, results, and interpretation.

Conclusion and Critical Commentary

- Briefly summarize the conclusions drawn by the speaker.
- Offer your opinions and insights into the speaker's work, paying particular attention to the quality of the data or analysis and the significance of the research.
- Provide brief commentary on the actual or potential applications of the research.
- Append any figures, tables, or equations used, and provide complete bibliographic information about any sources cited.

References

To write an effective report you will find it helpful to refer to sources other than the notes you take during the seminar. It is recommended that you obtain one or two key references pertaining to the speaker's work and review these papers in order to increase your understanding of the topic. It is recommended that you peruse the material before the talk, since it will enable you to get more out of the presentation and take an active part in the questioning afterward.

b. Chemistry 500 Proposal: The second year proposal requirement is an exercise in idea generation and prepares you for the more formal proposal to be given at the oral exam.

You are required to write **one** proposal for a research project that can be loosely based on some aspect of a seminar or colloquium attended. You will receive a grade for this proposal (1 credit of CHEM 500). You should fulfill this requirement either in the Fall Semester or in the Spring semester if you are giving your CHEM 500 seminar in the Fall. You can fulfill both requirements in the Fall semester if you so wish.

Guidelines for Preparing the CHEM 500 Proposal

The seminar-based proposal should contain original ideas for research projects that can derive from topics discussed in departmental seminars and colloquia. They should not be merely statements of how to extend the speaker's research with the next logical step. This written exercise is intended to help you learn to produce ideas for viable research projects. It should provide useful practice for the original proposal you will defend in your comprehensive exam. The proposal is to be short – no more than four pages[2]. Guidelines are similar to those for the CHEM 500 reports and are as follows:

1) In agreement with your preceptor, choose a seminar or topic on which to base your proposal.

2) Prepare the proposal according to the format below:

[2] This page limit includes single-spaced text (12 point or greater font) with 1" margins. Figures and references (size 10 font permissible) should not exceed three additional pages.

a. Describe briefly how the proposed work is related to the content of the seminar. (The connection need not be very direct - you can use seminars merely as a springboard for idea generation.)

b. Next should be a statement of the proposed project, stating why the results obtained would be significant, along with a brief description of any background needed to provide an adequate explanation of the significance.

c. Then describe what instrumentation, stating materials, computer time, etc. would be required in order to carry out the research proposed. Include some discussion of the estimated difficulty (in terms of time and expense) involved in such a project).

d. Finally, most new ideas have potential obstacles to success that may be more or less evident from the beginning. Some discussion of what these obstacles might be should be part of the proposal. Even better, discuss possible alternatives to circumvent the more obvious difficulties that might arise.

Obtain the cover page from the web site. Fill in and turn in with your draft to the Chemistry Graduate Office at least 6 weeks before the end of the semester. On the cover page, suggest the names of three faculty members who could serve as additional graders.

3) As for the report, iterate with your preceptor for ideas, implementation, and writing.

4) Turn in the final version to the Chemistry Graduate Office at least 3 weeks before the end of the semester. The final version will be forwarded to your preceptor and a second faculty member for grading. You should include the graded proposal with the documents you hand out to your committee at orals' time. Note that you are not allowed to use the same specific topic for your original comprehensive proposal.

c. Chemistry 500 Seminar: The chemistry 500 seminar must be presented prior to taking the oral comprehensive exam and during the first two years in residence. This seminar is to be given in one of the area seminar series on a topic not closely tied to research being done within the department. A written report on the subject of the seminar must also be prepared as a part of the overall requirement. The text of this report will be limited to no less than nine and no more than twelve double spaced pages in length. The student will be formally evaluated on both the seminar and written report by three members of the student's doctoral committee (Chemistry) faculty. (If one or more of the Doctoral Committee is unable to attend the seminar another member of the Chemistry Department can serve as a substitute.) Written reports are due to the graders one-week prior to the seminar date. Note that each area may have additional guidelines. You must obtain these from the area seminar chair. The overall grade achieved on the combination of the oral seminar and written report will be officially recorded as the grade for 1 credit of CHEM 500. A grade of 3.0 or better is required before a student can schedule his or her oral comprehensive exam. Students failing to obtain the minimum grade must repeat the entire seminar requirement until the minimum grade is achieved (up to a maximum of three times).